M017	Obligatory - Semester 9	**Constructive Geometry**	L+P+S 2+1+0	ECTS 4

Course objectives. In this course the most important topics of Euclidean geometry will be considered and this will be done from the point of view of constructive methods with the necessary theoretical foundation. The most important methods for solving constructive tasks will be systemized in this subject. A special emphasis is placed on the application of the constructive methods in the teaching contents of geometric character in elementary and secondary school. The lectures and exercises are presented by using dynamic geometry software.

Course prerequisites. Elementary Geometry.

Syllabus.
1. Euclidean constructions. Constructive task. Methods for solving constructive tasks. The algebraic method. The geometric locus of points.
2. Isometries of the Euclidean plane. Symmetry with respect to a line and symmetry with respect to a point. Translation and rotation. Glide symmetry. Group of isometries of the Euclidean plane and some of its subgroups.
3. Homothety and inversion.
4. Projective mappings. Cross-ratio. Perspective collineation. Perespective affinity. Curves of the second order: ellipse, hyperbola and parabola. Conic section. Pascal's and Brianchon's theorem. Curves od the second order as perspective images of a circle.
5. Constructions by limited means.
6. Non-elementary constructions. Ruler and compass constructions. Duplication of a cube and trisection of an angle. Non-elementary solutions of duplication of a cube and trisection of an angle. Quadrature of the circle. Approximate solutions of the three ancient problems.

Expected learning outcomes.
After completing the course, students are expected to:
- demonstrate an understanding of fundamental concepts of constructive geometry;
- understand theorems of constructive geometry and their proofs;
- be able to use different methods for solving constructive tasks;
- show an argumentative use of the transformation of a plane (isometries, similarities, inversion) in problem solving;
- use appropriate software of dynamic geometry when performing Euclidean constructions;
- show an argumentative use of mathematical statements in solving tasks.

Teaching methods and student assessment. Geometric contents will be actualized by demonstrations by means of dynamic geometry software during the lectures and practical work. Lectures and exercises are obligatory. The final exam follows after the completion of lectures and exercises and it consists of two parts, i.e. a written and an oral part. During the semester students have an opportunity to take two mid-term exams which cover the whole material. Acceptable mid-term exam scores replace the written examination.

Can the course be taught in English: Yes.

Basic literature:
1. D. Palman, Geometrijske konstrukcije, Element, Zagreb, 1996.

Recommended literature:
1. D. Palman, Trokut i kružnica, Element, Zagreb, 1994.
2. B. I. Argunov, M. B. Balk, Elementarnaja geometrija, Prosveščenie, Moskva, 1966. (Chapter V, Geometričeskie postroenija, pp. 265-354)